Missile technology and MLRS. Military-patriotic park "Patriot"

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Location: Moscow region, 55 km of the M-1 highway (Minskoe highway)
Official website: Military-patriotic park of culture and recreation of the Armed Forces of the Russian Federation “Patriot” (http://patriotp.ru/)
Additionally:: Park
“Patriot”. Exhibition “Space Forces: Through Hardships to the Stars” (msk_patriot_space.htm)
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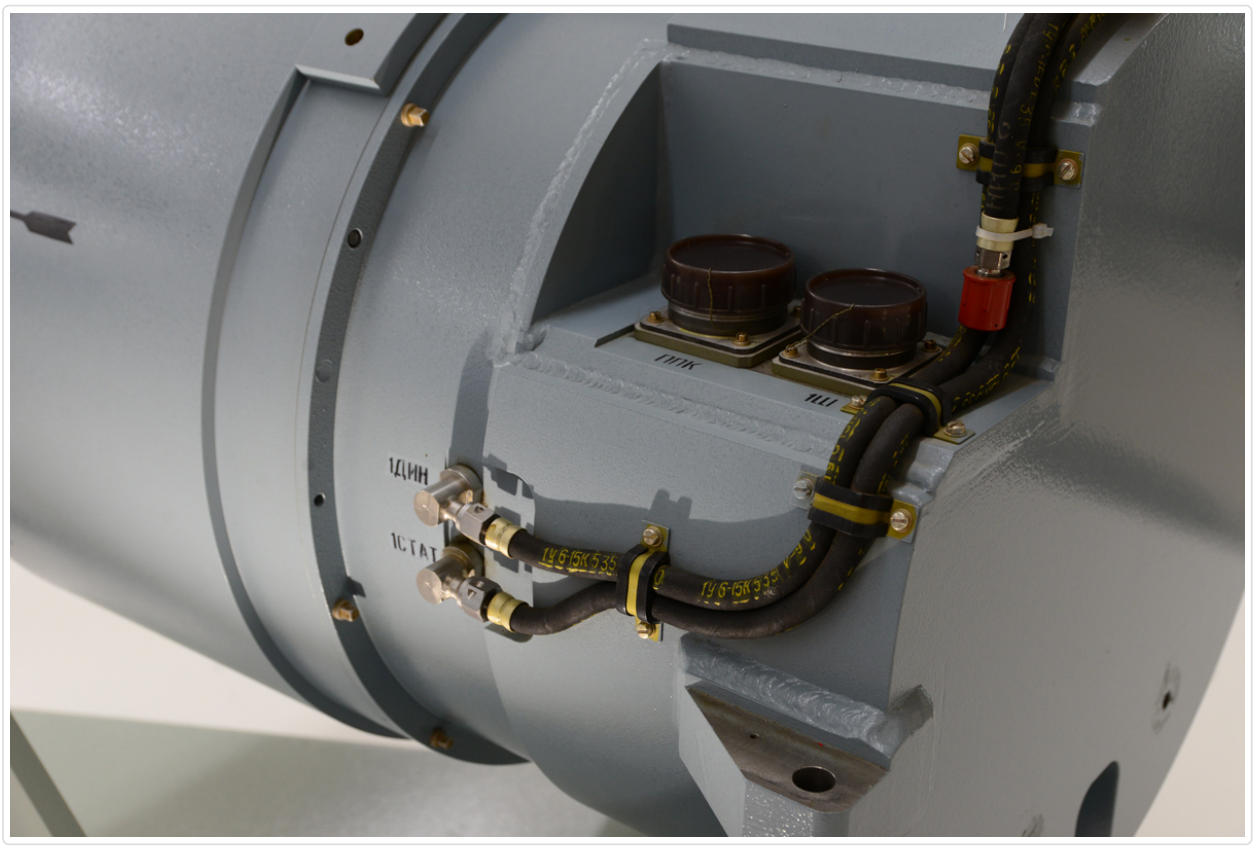
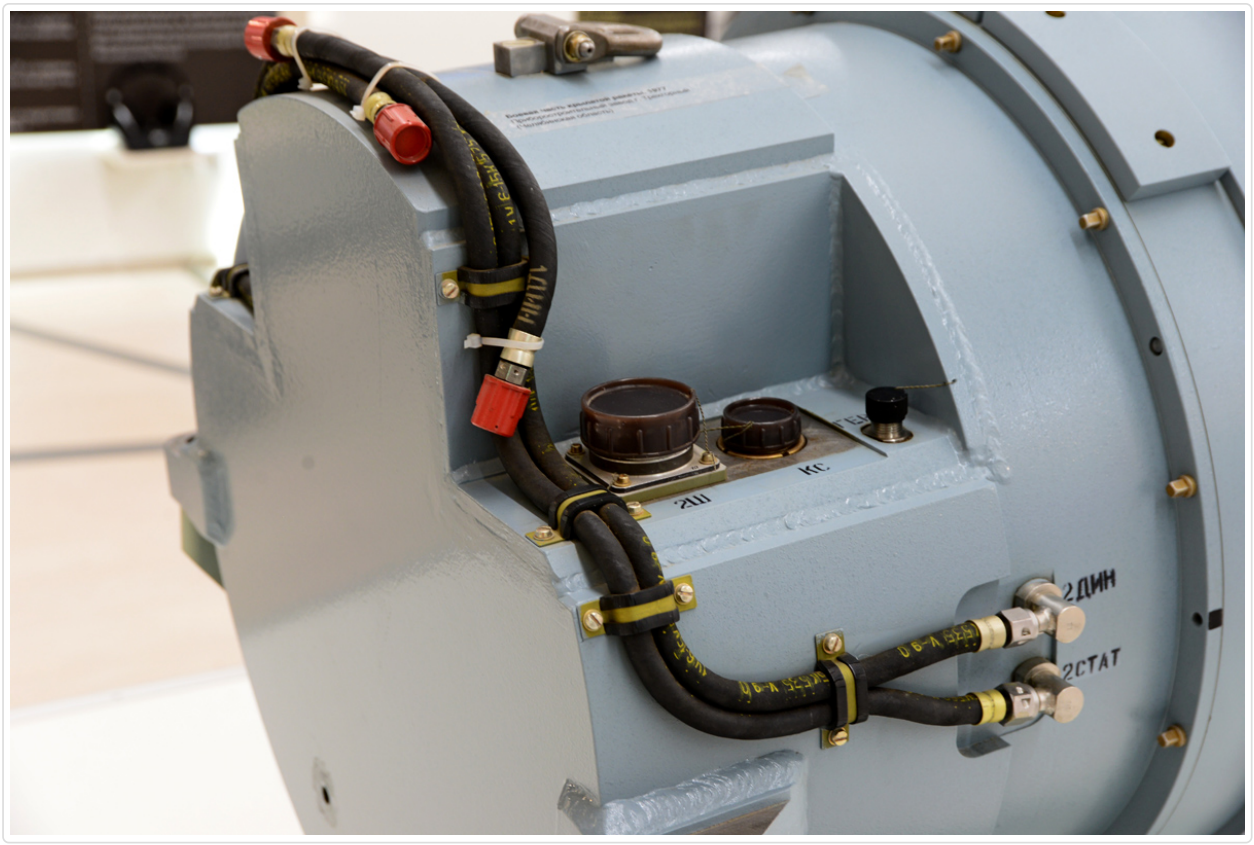
Exhibition of the 12th Main Directorate of the Russian Ministry of Defense, the military control body responsible for nuclear technical support and safety. At the request of the park's press service, I clarify that " *the exhibition is not located in the Military Patriotic Park of Culture and Recreation of the RF Armed Forces "Patriot", but at the stands of the exhibition pavilion KTRV (Tactical Missile Weapons Corporation).* "

(msk_patriot_missile/12gu/dsc_8219.jpg)
Model of the nuclear warhead of the P-35 and 3M44 Progress anti-ship cruise missiles



(msk_patriot_missile/12gu/dsc_8213jpg)



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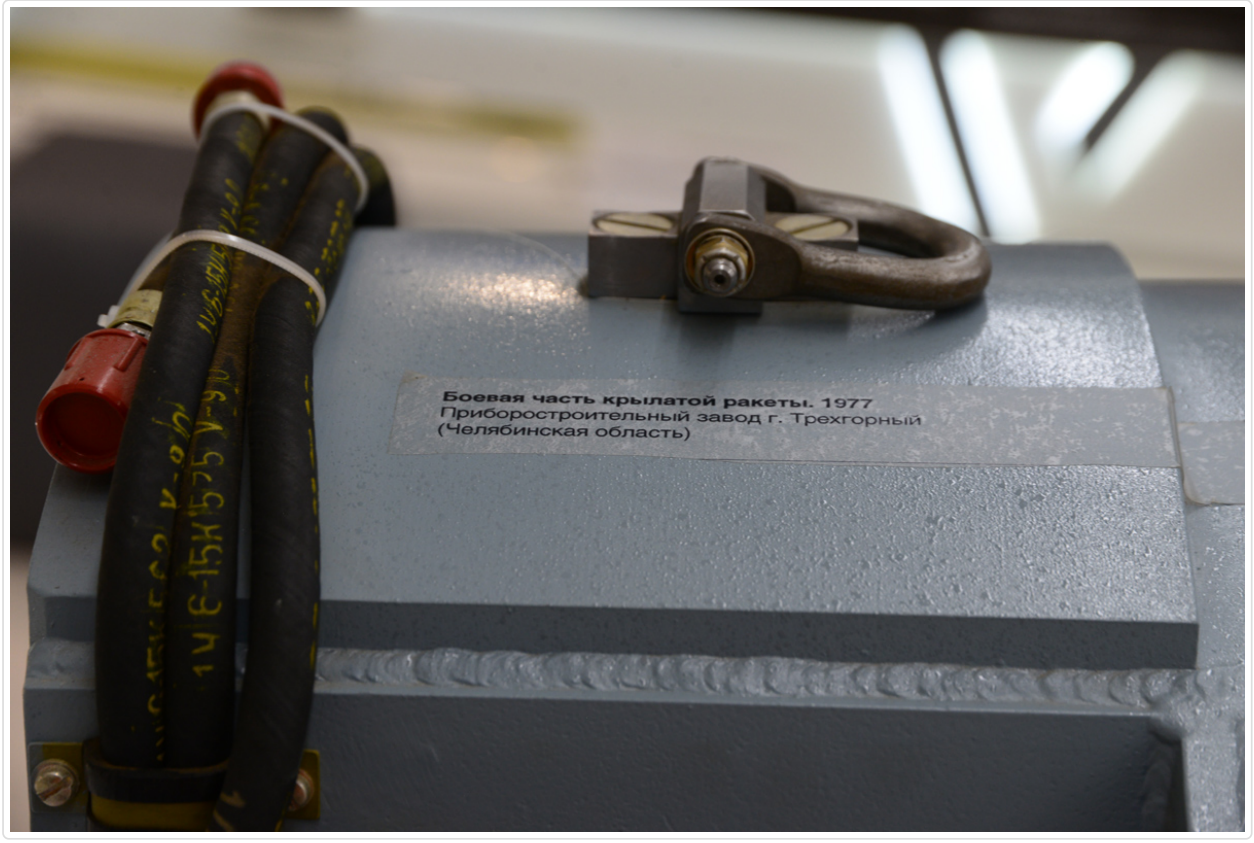

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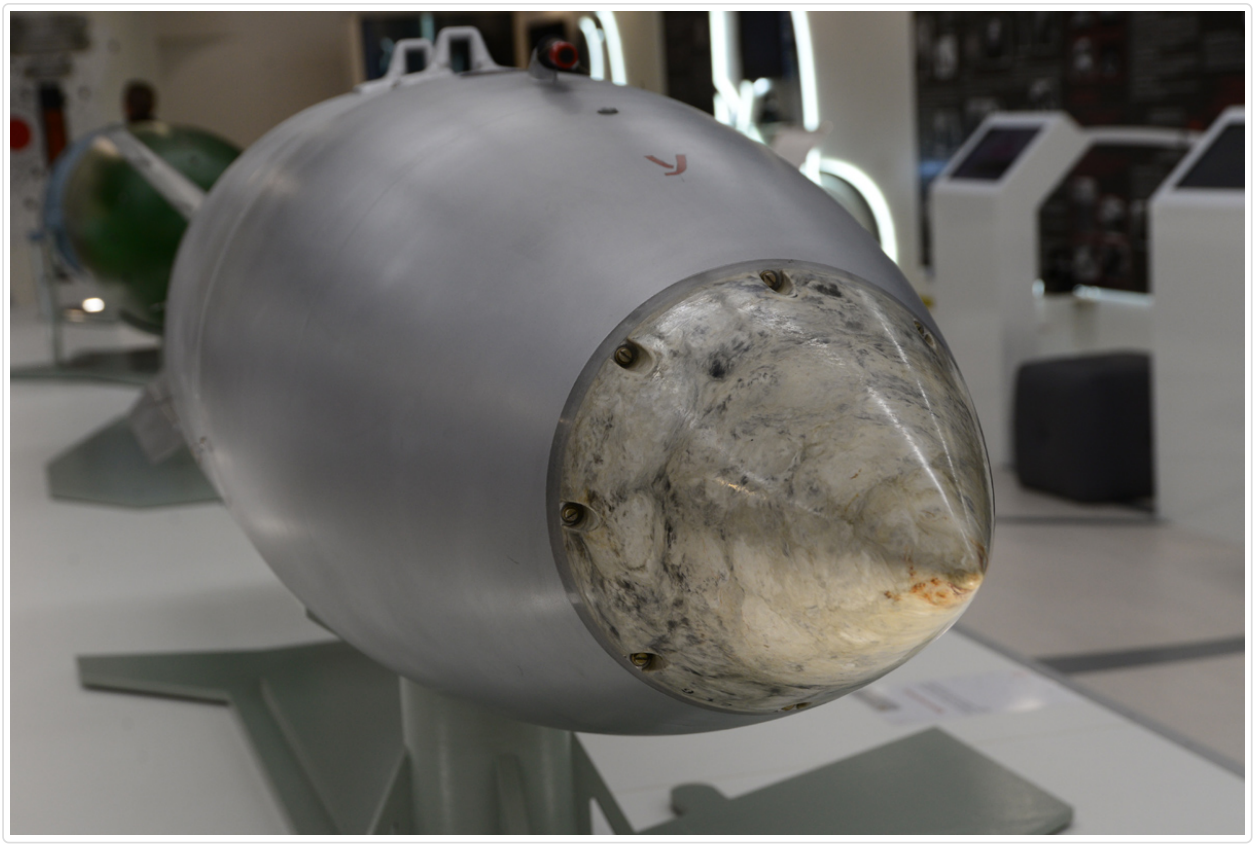
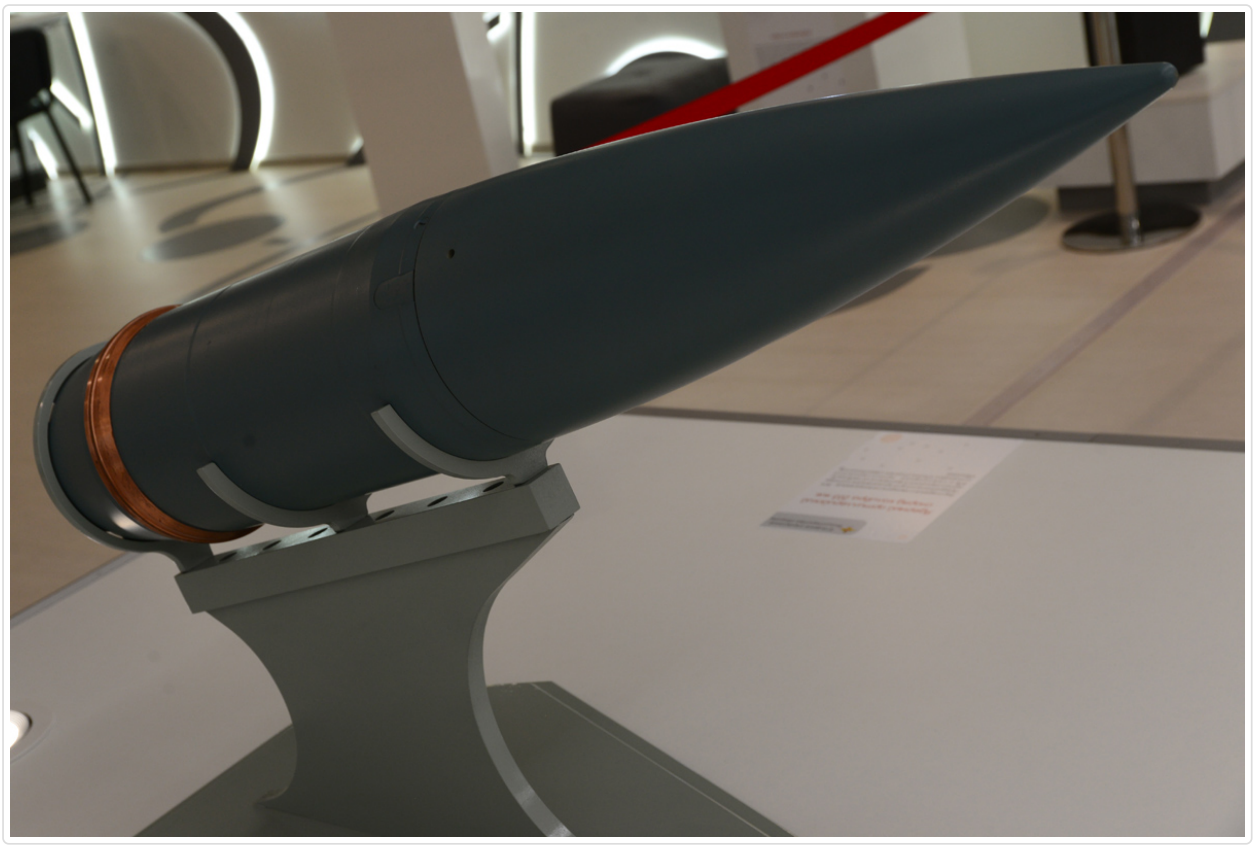


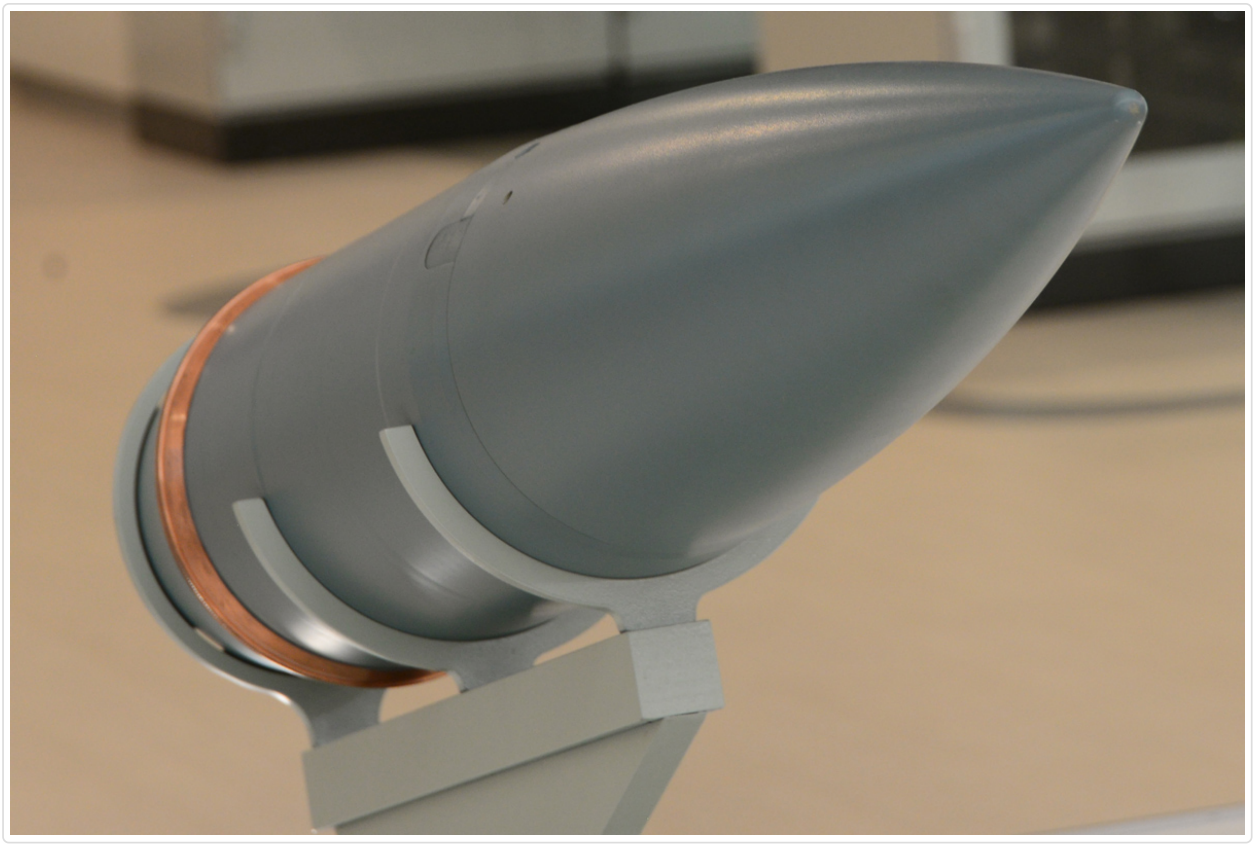
(msk_patriot_missile/12gu/dsc_8203.jpg)

Model of the 244N aerial bomb with a nuclear charge. The bomb was in service from 1969 to 1980. Developer: RFNC-VNIITF.



(msk_patriot_missile/12gu/dsc_8215.jpg)

Model of an atomic projectile of 203 mm caliber

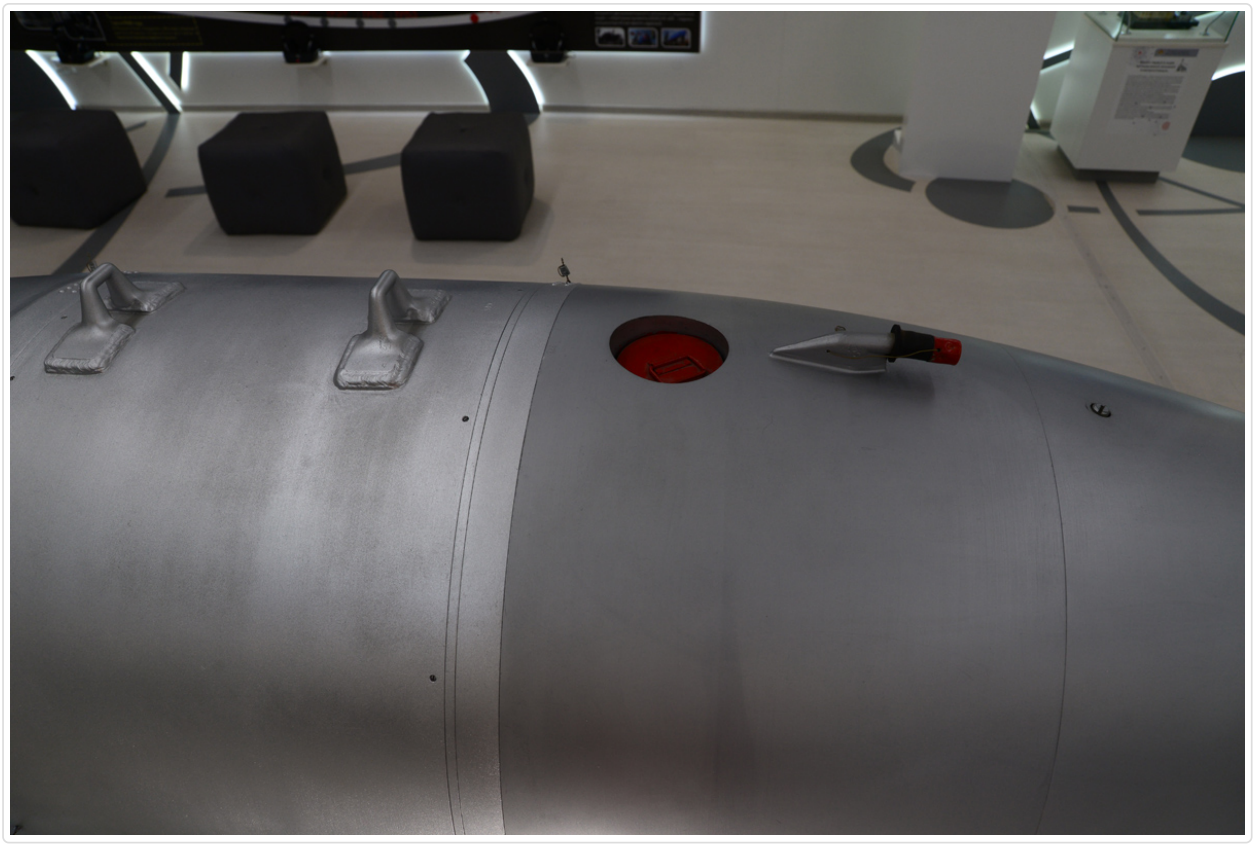


(msk_patriot_missile/12gu/dsc_8220.jpg)
Model of an atomic projectile of 152 mm caliber

(msk_patriot_missile/12gu/dsc_8204.jpg)
Model of the special warhead of the SAET-60 torpedo. Serial production - instrument-making plant (Trekhgorny). In service: 1967-1980.

(msk_patriot_missile/12gu/dsc_8199.jpg)
Model of a tactical small-sized aerial bomb “244N” with a nuclear charge

(msk_patriot_missile/12gu/dsc_8200.jpg)
The nose part is made of radio-transparent material to ensure the operation of the radio altimeter of the detonation system



(msk_patriot_missile/12gu/dsc_8201.jpg)

Aerodynamic shape with a low drag coefficient is determined by the use of external suspension of supersonic aircraft

(msk_patriot_missile/12gu/dsc_8206.jpg)

The tail cone contains a brake parachute container

Liquid two-stage silo-based ICBM UR-100K

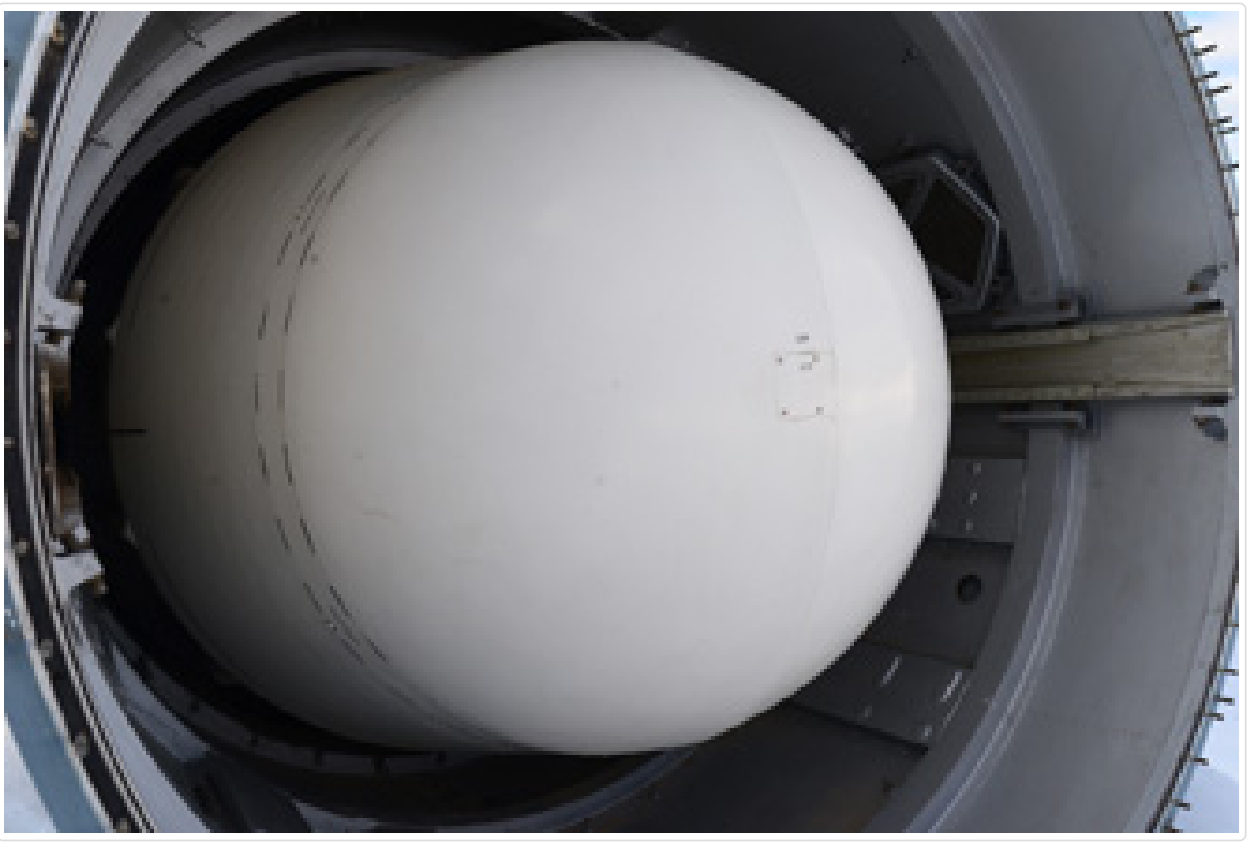
The modified UR-100K ICBM was developed at the Central Design Bureau for Mechanical Engineering under the leadership of Vladimir Chelomey and at the Filyo Branch No. 1 of the Central Design Bureau under the leadership of Viktor Bugaisky. Development of the UR-100K began in 1967. Flight

development tests at the Baikonur test site were completed in 1971. The complex was put into service on December 28, 1972. The designers managed to increase the shooting accuracy, the power of the nuclear warhead, and increase the service life of the main engines. The rocket tanks accommodated an increased amount of fuel. The launch weight of the rocket has been increased to 50.1 tons. Payload weight – up to 1,200 kg. The firing range has increased to 12,000 kilometers. The autonomous control system was developed at NII-944 under the leadership of Viktor Kuznetsov.

The missile was equipped with three warheads that did not have an individual target guidance system. Along with the R-36P ICBM, the UR-100K missile was one of the first ICBMs equipped with MIRVs.

After the completion of the second stage, the pyrobolts released the warheads and, according to the program, they were pushed by the pyromechanism in different directions. The distance of the blocks from the aiming point at the moment of approaching the ground was approximately 1.5-2 kilometers.

Source: Pervov M., "Missile systems of the Strategic Missile Forces" ("Equipment and weapons", No. 05-06/2001)



(msk_patriot_missile/15a20/dsc_7006.jpg)

UR-100K (15A20, RS-10) in the transport and launch container 15YA42 is the first Soviet ICBM with a cluster warhead designed to destroy area targets.

(msk_patriot_missile/15a20/dsc_7007.jpg)

Serial production of UR-100 missiles of various modifications at the Moscow Machine-Building Plant named after M.V. Khrunichev lasted from 1964 to 1974. The missiles were also mass-produced by the Omsk production association Polet and the Orenburg production association Strela.

(msk_patriot_missile/15a20/dsc_7008.jpg)

In addition to the monoblock warhead, the UR-100K could be equipped with a cassette warhead with three warheads, while various front compartments were installed, which housed means of penetrating enemy missile defenses. When using a cassette warhead, the warheads were covered with an aerodynamic fairing, which split into two parts and was dropped at the end of the active phase of the flight.

(msk_patriot_missile/15a20/dsc_7015.jpg)
The filling necks were located on the upper frame of the transport and launch container.

“To dock the second stage of the missile with a monoblock and multiple warheads, front compartments specially designed for each type of warhead were used... The internal volumes of the compartments contained means of overcoming the enemy’s missile defense - decoys. The release of decoys was carried out on command from the missile control system at the end of the active section flight path before separation of the warhead."
Source: Intercontinental ballistic missiles of the USSR (RF) and the USA. History of creation, development and reduction (Ed. E.B. Volkov).

Liquid two-stage silo-based ICBM UR-100N UTTH

“The government decree on the development of the UR-100N missile system with improved tactical and technical characteristics was issued on August 16, 1976. The UR-100N UTTH ICBM was developed at the Central Design Bureau for Mechanical Engineering under the leadership of Vladimir Chelomey and at the Filyovsky Branch No. 1 of the Central Design Bureau headed by Viktor Bugaisky.
In connection with In order to increase the accuracy of American intercontinental ballistic missiles, it was necessary to increase the level of security of silo launchers, as well as to use a new set of means to overcome enemy missile defense.
A series of test launches of the UR-100N UTTH were carried out from December 1977 to June 1979 at the Baikonur test site on December 17, 1980. adopted for service. In January 1981, the first UR-100N UTTH regiments entered combat duty. A total of 360 UR-100N UTTH silo launchers were put on combat duty."
Source: Pervov M., “Missile systems of the Strategic Missile Forces” (“Equipment and weapons”, No. 05-06/2001)

(msk_patriot_missile/15a35/dsc_6984.jpg)

Warhead 15F355 - multiple warhead with 6 individually targeted thermonuclear warheads and a set of missile defense penetration means

(msk_patriot_missile/15a35/dsc_6986.jpg)

UR-100NU (15A35) – modernization of 15A30 in order to improve performance in terms of efficiency, shooting accuracy, security

(msk_patriot_missile/15a35/dsc_6988.jpg)
UR-100N UTTH missiles are placed in OS type silos with increased security. The protective roof of the mine opens upward using a special pneumohydraulic drive. The missile regiment includes 10 silos and one container-type command post, located in a special protected silo

(msk_patriot_missile/15a35/dsc_6992.jpg)
The ends of the TPK 15YA54 were closed with flexible multilayer diaphragms with a sewn-in cable system, which tore them off during rocket launch

"Before 1999, 81 launches of UR-100N UTTH were carried out. Of these, 27 flight launches, 25 batch protection launches and 29 other launches. During regularly conducted combat training launches of the UR-100N UTTH ICBM, research is carried out, the results of which extend the warranty life In November

1994, a combat training launch of a missile was carried out, which had been on combat duty for more than 18 years. On June 10, 1997, a missile was launched from the Baikonur test site, which had been on combat duty for 20 years in a division stationed near Kozelsk. The test results confirmed the high reliability of the missile. complex and the possibility of extending its service life for several years. The last test launch of the UR-100N UTTH at the Baikonur test site was carried out on October 7, 1998. The missile was on combat duty for 22 years,

Leonid Shelepin, head of the mechanical engineering department, told me about the missile: "PC design. -18 is very reliable. In 1999, it is planned to increase the service life to twenty-five years. In the future, this period may be extended to thirty years. Warranty supervision of operation is successful. Now small routine maintenance is carried out once every three months, large routine maintenance - once every three years."

Source: Pervov M., "Missile systems of the Strategic Missile Forces" ("Equipment and weapons", No. 05-06/2001)

Launch vehicle "Cyclone-3" (11K68)

"In the early 60s, the Separate Design Bureau (OKB-586), headed by M.K. Yangel (now the Yuzhnoye Design Bureau, Dnepropetrovsk), worked on combat missile systems and at the same time began creating space vehicles based on Thus, on the basis of the single-stage medium-range ballistic missiles R-12 and R-14, the light-class PH "Cosmos-2" and "Cosmos-3" appeared, respectively, and the two-stage ICBM R-36 in the orbital version was capable of launching warheads. This is why in August 1965 , on the basis of a government decree, the Yuzhnoye Design Bureau began work on creating a two-stage launch vehicle based on the R-36. At the same time, its capabilities were considered in the case of installing a third stage...

Back

in 1962. year, TsNIIMash proposed using the R-16 missiles, which had just been put into service, to launch Meteor meteorological satellites. However, it was decided to modify the Vostok PH for these purposes. But after a few years the situation changed. Beginning in 1969, it was planned to remove the P-16 from combat duty with the expired warranty storage period. In this case, Yangel's proposal promised a huge economic effect. According to his plan, such ICBMs are immediately sent to the test site, where an additional stage with a spacecraft filled with fuel is docked to them and the combat rocket is turned into a launch vehicle.

Yangel's proposal was accepted, but partially. In July 1967, the Council of Ministers of the USSR adopted a resolution on the use of a launch vehicle developed on the basis of the R-36 for launches of spacecraft of the Cosmos and Meteor series. And in August 1968, the tactical and technical assignment specified that two launch vehicles would be created based on the R-36 missile: a two-stage one to solve the problems defined by the 1965 decree, and a three-stage one as a universal light-class carrier. In 1988, the three-stage version received the name "Cyclone". Considering the history of the creation of this carrier, it is advisable to call it "Cyclone-3", and the two-stage version – "Cyclone-2". The name "Cyclone-1" could be assigned to the unrealized PH project based on the R-16 missile, since the R-36 ICBM is its further development."

Source: S. Sergeev, "Cyclone" ("Aviation and Cosmonautics", No. 3- 4/1994)

(msk_patriot_missile/hurricane-3/img_5582.jpg)

Second stage

(msk_patriot_missile/hurricane-3/img_5583.jpg)

(msk_patriot_missile/hurricane-3/img_5586.jpg)

(msk_patriot_missile/hurricane-3/dsc_8262.jpg)

"PH "Cyclone" is made according to the classical "tandem" scheme, that is, all its stages are connected in series. The designs of the housings of the first and second stages of "Cyclone-2, -3" are almost completely unified with each other. For their manufacture, at one time, housings and propulsion engines were used installation of R-36 combat missiles.

The third stage of the PH "Cyclone-3" is a practical implementation of the design of the universal S5M stage. It is made in an ampoule version, which ensures its long-term storage in a fueled state. To reduce the external dimensions of the stage, its propulsion system is placed inside a toroidal one. fuel compartment. The stage has its own autonomous inertial control system, which is connected to the

control system of the first and second stages only through a system for coordinating the axes of the gyro devices. The necessary coordination of the operation of both control systems is ensured by exchanging a minimum number of commands and signals

...

All PH engines. Cyclone" work on self-igniting components of rocket fuel - nitrogen tetroxide and unsymmetrical dimethylhydrazine. The propulsion systems of the first and second stages consist of propulsion (MD) and steering (RD) engines. The design of the third stage MD, depending on the given flight pattern, ensures its activation once or twice. The flight control of the third stage is carried out using eight fixed exhaust nozzles of the gas generator of the MD turbopump unit. During the flight phase with the thruster switched off, attitude control is provided by ten low-thrust rocket engines. To ensure the launch of the MD in zero gravity conditions, special mesh separators are installed in the fuel compartment of the third stage. And before restarting the MD, a liquid propulsion system is used - a launch support unit, which creates longitudinal acceleration to move fuel to the intake devices. The third stage is connected to the second using a special adapter, to which the head fairing is also attached.

Cyclone-3 launches spacecraft into specified orbits along “rigid” trajectories, the parameters of which are stored in the control system’s memory in the form of programs for changing the speed and angular orientation of the rocket depending on the time from the moment of launch. In flight, the control system, using its inertial meters, determines the actual values of the motion parameters, compares them with the calculated values and generates control signals, with the help of which the current speed and orientation angles of the rocket are changed until they coincide with the calculated ones. The required set of flight programs along nominal trajectories is calculated in advance and recorded in the memory of the on-board equipment during its manufacture. In the course of preparing the PH for launch, the cosmodrome's ballistics specialists draw up a flight mission, which specifies the required motion program and configuration parameters of the control systems. Flight mission data is recorded in the memory of the carrier's control systems in the last minutes of pre-launch preparation.

“Cyclone-3” starts from a fixed launcher, after which it turns around the longitudinal axis at a given angle. The separation of the first and second stages occurs according to a semi-hot scheme: the RD of the second stage is launched before the separation of the first, and the MD - after separation and departure from the first stage to a safe distance. The head fairing is discarded during the operation of the second stage after passing through the dense layers of the atmosphere. The operating time of the first two stages does not depend on the height of the final orbit and is selected based on the location of the areas allocated for the fall of the separated stages and fairing flaps.

The spacecraft reaches the required orbit using the third stage. Its design provides ample opportunities for the implementation of energetically optimal trajectories for launching spacecraft into initial orbits, both circular and elliptical with any given perigee position. For this purpose, control of the time, duration and number of starts of its engine is provided."

Source: S. Sergeev, “Cyclone” (“Aviation and Cosmonautics”, No. 3-4/1994)

(msk_patriot_missile/hurricane-3/dsc_8292.jpg)

Third stage

(msk_patriot_missile/hurricane-3/img_5585.jpg)

Third stage

(msk_patriot_missile/hurricane-3/dsc_8263.jpg)
The first stage consists of a transition compartment, an oxidizer tank, an instrument compartment, a fuel tank and a tail compartment.

(msk_patriot_missile/hurricane-3/dsc_8293.jpg)
The first and second stages of the Cyclone-3 launch vehicle are almost identical to the stages of the Cyclone-2 launch vehicle (11K69), developed on the basis of the R-36 ICBM

"Flight tests of Cyclone-3 took place at the Plesetsk cosmodrome from June 24, 1977 to February 12, 1979. There were six launches in total, and the planned test program was completed ahead of schedule. The new rocket system was ready to replace the two old ones - Cosmos-3" and "Vostok", but only in January 1980 the Council of Ministers of the USSR adopted a resolution to accept it into operation.

For a long time, “Cyclone-3” actually “remained without work”. Only in 1984 were spacecraft launches that were completely transferred to it. This was carried out using the Vostok PH. And currently it is used less than half of its capabilities. With the help of Cyclone-3, the Meteor, Ocean, Monsoon and automated universal orbital spacecraft are launched into medium-altitude circumpolar orbits. stations for conducting fundamental research in the field of geo- and heliophysics. In addition, spacecraft are launched in the interests of the Ministry of Defense, including low-orbit communication satellites, on the basis of which the Gonets spacecraft is currently being developed.
...
Thanks to the energy capabilities of Cyclone-3, when launched along flat trajectories, it makes it possible to deliver most existing and a number of promising vehicles into sun-synchronous orbits, but at the same time the rocket will fly over Canada and the USA. It is also not suitable to start in the south-west direction, since our densely populated areas are located there. There is only one way left - to launch the rocket along the existing route, and then, using a spatial maneuver during the operation of the third stage, launch the satellite into a sun-synchronous orbit. The price to pay here is a reduction in payload mass.

At the mentioned meeting, the prospects of the third direction and the possibility of its implementation in the shortest possible time were noted, since the possibility of implementing a spatial maneuver was provided for at the stage of preliminary design of the S5M stage. However, by the start of flight tests they did not have time to implement it, and such a maneuver was not specified in the tactical and technical specifications of 1968. It turned out that it was necessary to modify the control system, and this required a task on... a new medium. The trouble with the domestic cosmonautics: the lack of a unified, well-thought-out policy in the development of the national transport space system, sometimes unjustified haste in the creation of its elements and the impossibility of gradually modernizing launch vehicles during their operation.
As a result, proposals to improve Cyclone-3 were buried. But, despite this, PH continues to remain one of the best carriers of its class with good reserves for modernization."
Source: S. Sergeev, “Cyclone” (“Aviation and Cosmonautics”, No. 3-4/1994)

Autonomous launcher 15U168 of the 15P158 Topol missile system

The development of the intercontinental three-stage ballistic missile RT-2PM on solid mixed fuel with a monoblock nuclear warhead was carried out by the Moscow Institute of Thermal Engineering under the leadership of chief designer Nadiradze (after his death, the development was continued by Lagutin) and is a further modernization of the RT-2P missile. The first flight test of the missile was carried out at the Plesetsk test site on February 8, 1983, and in 1985 the RT-2PM missile entered service with the Strategic Missile Forces. The RT-2PM missile is produced in Votkinsk, its launcher - a seven-axle vehicle of the MAZ-7310 type (later modifications to the MAZ-7917) - at the Barrikady plant in Volgograd.
Source: Russian Arms Forum :: 15P158 “Topol” - a mobile ground-based missile system with an RT-2PM missile (15Zh58) (http://www.russianarms.ru/forum/index.php/topic,1026.0.html)

(msk_patriot_missile/topol_pu/dsc_6027.jpg)
Block of gyroscopes lowered to the ground

(msk_patriot_missile/topol_pu/dsc_6029.jpg)
The RT-2PM missile spends its entire service life in a sealed transport and launch container 22 meters long and 2 meters in diameter.

(msk_patriot_missile/topol_pu/dsc_6031.jpg)
The TPK is sealed and maintains a certain temperature and humidity regime. In the event of a hole in the housing or a break in the rubber couplings on the air ducts of the TVR system, the crew will receive a corresponding report.

(msk_patriot_missile/topol_pu/dsc_6028.jpg)
The exhibit is located on the territory of the Patriot Convention and Exhibition Center

It is declared that, unlike the RSD-10 and Temp-2S, the Topol complex missile can be launched from any point on the combat patrol route. In fact, even modern modifications do not have this capability. "When receiving an order to launch according to the ASBU, the APU crew is obliged to occupy the nearest route point suitable for launch and deploy the APU." "The closest suitable" means one that has predetermined coordinates and is previously prepared in engineering matters. For this purpose,

periodically, in accordance with the NS and ZBU plans, reconnaissance of field positions and patrol routes is carried out, during which a list of works is determined, where something should be cut down, leveled, added or strengthened. This is what is called "from any [of pre-selected] points."

To launch from an unequipped position, the launcher is hung on jacks and leveled. Preparation time for the start is about 2 minutes. The type of launch is mortar: after installing the "pencil case" in a vertical position and shooting off its upper cap, the powder pressure accumulators push the rocket out of it to a height of several meters, after which the first stage propulsion engine is started.

If necessary, the RS-12M can be launched directly from the hangar during parking for maintenance, through the sliding roof. Initially, the roof was removable (fastened with squibs, with concrete counterweights at the ends). In harsh winter conditions they performed negatively (it was impossible to determine the exact mass of the counterweight due to snowfall; the average reading led to either jamming or falling off the guides; in addition, without shooting it is not possible to determine the condition of the squib). Replaced with older and more reliable (improved compared to Pioneer) electromechanical drives.

Source: Russian Arms Forum :: 15P158 "Topol" - a mobile ground-based missile system with an RT-2PM missile (15Zh58) (http://www.russianarms.ru/forum/index.php/topic,1026.0.html)

(msk_patriot_missile/topol_pu/dsc_6046.jpg)

(msk_patriot_missile/topol_pu/dsc_6035.jpg)
Air ducts for maintaining temperature and humidity conditions

(msk_patriot_missile/topol_pu/dsc_6038.jpg)
Doppler speed sensor, the radiation pattern is projected onto the road, behind the clearance

(msk_patriot_missile/topol_pu/dsc_6039.jpg)
Cover of the transport and launch container

The RT-2PM missile is designed according to a design with three sustainer stages. The rocket used a new, more advanced mixed fuel developed at the Lyubertsy LNPO Soyuz. All three stages are equipped with solid propellant rocket engines with one fixed nozzle. The body of the first stage housed four folding rotary lattice aerodynamic rudders, used for flight control together with gas-jet rudders, and four lattice aerodynamic stabilizers. The bodies of the upper stages were manufactured using the method of continuous winding from organoplastic according to the "cocoon" pattern. The third stage was equipped with a transition compartment for attaching the warhead. The firing range was controlled by cutting off the third-stage propulsion engine, using a thrust cut-off unit, with eight reversible bells and "windows" cut through by detonating charges in the organoplastic power structure of the body.
In 1984, the construction of stationary structures and the equipment of combat patrol routes for Topol mobile missile systems began in the positional areas of the RT-2P and UR-100 ICBMs being removed from duty and located in the OS silos. Later, the positioning areas of medium-range complexes removed from service under the INF Treaty were arranged.
Source: Russian Arms Forum :: 15P158 "Topol" - a mobile ground-based missile system with an RT-2PM missile (15Zh58) (http://www.russianarms.ru/forum/index.php/topic,1026.0.html)

Communications vehicle No. 1 (MS-1) 15B179 of the missile division and PKP of the missile regiment

The communications vehicle (MS-1) of the mobile command post of the missile division and the mobile command post (PKP) of the missile regiment of the 15P158 complex, unit 15B179, is intended for organizing and carrying out combat duty by a communications crew on the march or in a field position. The task is continuous monitoring of the performance of transmitting devices and communication equipment. Development and production - Krasnodar Instrument Plant (KPZ), RSFSR. MS-1 (15V179 unit) was developed for the 15P158 Topol PGRK based on the 15V82 unit.
Russian Arms Forum :: 15B179 – communication vehicle No. 1 (MS-1) of the missile division and PKP of the missile regiment (http://www.russianarms.ru/forum/index.php/topic,3919.0.html)

(msk_patriot_missile/topol_svyaz/dsc_6110.jpg)
A 1K25-1M4-01 air conditioner and two FVUA-100V-24 filter ventilation units are mounted on the front wall of the body. On the left wall in the front part of the body there is a large loading hatch into the SES compartment.

(msk_patriot_missile/topol_svyaz/dsc_6102.jpg)
Two air intake hatches for radiators of the ADA cooling system; exhaust pipes (above the air intake hatches) are covered with a casing on three sides; two whip antennas for the R-138 "Skvorets". Missing: folding platform and telescopic AMU for VHF receivers of the 15E1061 “Keychain” complex.

(msk_patriot_missile/topol_svyaz/dsc_6103.jpg)
The power supply for the unit on the march is provided by two (diesel automated units) ADA-12, each with a power of 12 kW

(msk_patriot_missile/topol_svyaz/dsc_6101.jpg)
The BK-700 roof antenna for the VHF receivers of the 15E1061 “Keychain” complex (providing communications on the march) is clearly visible. Under the rear overhang of the body, in boxes, there are three reels with control, communication and power cables.

The exhibit is located on the territory of the Patriot Convention and Exhibition Center

Tropospheric communication station, communication vehicle No. 2 (MS-2) 15B75 PKP missile regiment

Tropospheric communication station, communication vehicle No. 2 (MS-2) of the mobile command post of the missile regiment and communication vehicle No. 3 (MS-3) of the mobile reserve command post of the missile division. The 15B75 “Torf-2” unit is a modification for the mobile ground-based missile system of the Strategic Missile Forces of the R-412A “Torf” tropospheric communication station.
Purpose:
– to organize communications with higher levels of management and was used to organize communications in the link “PKP missile regiment - KP (PZKP) rd”;
– ensuring combat duty by a communications crew at a field position.
Calculation tasks:
– provision of direct communication lines and tropospheric communication at the operational-tactical control level;
– ensuring two-way duplex communication with a fixed communication center via telephone channels;
– continuous monitoring of the performance of transmitting and receiving devices and communication equipment.
Source: Russian Arms Forum :: 15B75 – communication vehicle MS-2 PKP RP and MS-3 PZKP rd, tropospheric communication station (http://www.russianarms.ru/forum/index.php/topic,3921.0.html)

(msk_patriot_missile/topol_svyaz2/dsc_6088.jpg)

(msk_patriot_missile/topol_svyaz2/dsc_6089.jpg)
Symmetrical two-mirror antenna

(msk_patriot_missile/topol_svyaz2/dsc_6090.jpg)
Antenna-mast device FL-95M “Sosna-20M”

(msk_patriot_missile/topol_svyaz2/dsc_6092.jpg)

Structurally, the body inside is divided by partitions into 2 compartments:
– compartment No. 1 – operator's room with places for duty duty by the communications crew. SES elements were located in the same compartment;
– compartment No. 2 – hardware compartment in which communication equipment is located. To reduce the intensity of microwave oscillations to acceptable sanitary standards, the partition of the hardware compartment is made of shielding materials.
Behind the body, in an open area, there is an antenna mast device (AMU) FL-95M "Sosna-20M" with a set of antennas. AMU consists of two sections. When deployed, the lower section first rises, and then the upper section with a symmetrical two-mirror antenna installed on it begins to move out of it (due to the shape of the antenna dishes, the car was called "Cheburashka", and the service personnel were called "lopushatniks"). To ensure communications on the march, the radio station R-123M "Magnolia" (R-173 "Paragraph") is used. The whip antenna (AS) for the R-123, 2/4 m high (when marching/parked), is located on the roof of the driver's cabin of the unit. Operation of the main equipment of the unit is possible only when parked.
Source: Russian Arms Forum :: 15B75 – communication vehicle MS-2 PKP RP and MS-3 PZKP rd, tropospheric communication station (http://www.russianarms.ru/forum/index.php/topic,3921.0.html)

(msk_patriot_missile/topol_svyaz2/dsc_6093.jpg)

(msk_patriot_missile/topol_svyaz2/dsc_6099.jpg)

In the boxes under the rear overhang of the body there were three reels with control, communication and power cables

(msk_patriot_missile/topol_svyaz2/dsc_6100.jpg)

(msk_patriot_missile/topol_svyaz2/dsc_6094.jpg)

The exhibit is located on the territory of the Patriot Convention and Exhibition Center

Combat duty support vehicle 15B148

The unit includes systems for power supply, control, communications, microclimate, heating, ventilation, water supply, warning, kitchen, storage and household equipment. The combat duty support vehicle (MCSD) is designed to provide:

• electricity to consumers at a field position and in case of an emergency at the combat post;

- preparing and eating food by personnel;
- rest and daily life of personnel free from combat equipment in field conditions;
- organizing and performing guard duty in the field.

Development - Central Design Bureau "Titan", Volgograd, for PGRK 15P158 "Topol". Production - PA "Barricades", Volgograd, from 1985 to 1989. The dimensions and equipment of the unit are designed to support the livelihoods of ten people with personal belongings and weapons. MOBD 15B148 combines the functions of four units that were part of the Pioneer PGRK: MDES 15N1061M, canteen machine 15T117, dormitory machine 15T118, MDSO 15YA55.

Source: Russian Arms Forum :: 15B148 – combat duty support vehicle (MOBD) (http://www.russianarms.ru/forum/index.php/topic,3426.0.html)

(msk_patriot_missile/topol_mobd/dsc_6042.jpg)

The 15B148 combat duty support vehicle was put into service in 1985

(msk_patriot_missile/topol_mobd/dsc_6082.jpg)
A device for raising and lowering a two-meter whip antenna of the R-173 radio station is mounted on the combat compartment next to the turret-machine-gun mount.

(msk_patriot_missile/topol_mobd/dsc_6083.jpg)
MOBD uses the MAZ-543M all-terrain wheeled chassis

(msk_patriot_missile/topol_mobd/dsc_6085.jpg)

The entrance to 15B148 is located on the starboard side. Since 1989, MOBD 15V231 has been produced for the Topol PGRK, the entrance to which is located on the left side, due to a change in the layout of the BES. The latest modification of the MOBD is 15V240M (for PGRK 15P165 “Topol-M”, “Yars”).

The exhibit is located on the territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/topol_mobd/dsc_6128.jpg)

(msk_patriot_missile/topol_mobd/dsc_6098.jpg)
Turret-machine gun mount (BPU) 55L140 "Luch" with NSVT machine gun 12.7 mm caliber

(msk_patriot_missile/topol_mobd/dsc_6097.jpg)

(msk_patriot_missile/topol_mobd/dsc_6086.jpg)
Above the cabin is an outdoor air conditioner unit 1K25.

Structurally, the unit is made of two compartments that are not rigidly connected to each other. The first compartment is a diesel one, which houses two AD-30 diesel-electric units with a power of 30 kW and an AD control unit in manual mode. To eliminate the transmission of vibration from the diesel compartment to the main compartment, the diesel compartment is mounted on damping devices, which are fixed when the unit is marching. In the side walls of the body of the first compartment there are hatches for the intake and exhaust of air from the radiators of the units. To reduce the noise level of the IM exhaust, the 15B148 unit is equipped with a vertical type exhaust pipe with a compensating device (a 4-meter long pipe covered with asbestos-gypsum cord). Between the first and second compartments there is a fuel tank with a fuel supply of 2398 liters for the IM.
The second compartment is the main one. It is divided by partitions into seven compartments for various purposes. The compartment is equipped with air conditioning, heating and ventilation unit OV-65 and filter and ventilation unit FVUA-100V-24.
Three compartments are used to accommodate people - two four-seater compartments for resting personnel and a two-seater compartment for resting the chief of the guard and his assistant. There is a compartment-dining room for meals for personnel - 4 people can eat at the same time. The dining room compartment is equipped with one folding bed for the cook. The kitchen compartment has a stove for cooking, food storage compartments, a refrigerator, and space for storing dishes and washing them.
Source: Russian Arms Forum :: 15B148 – combat duty support vehicle (MOBD) (http://www.russianarms.ru/forum/index.php/topic,3426.0.html)

Hostel car 15T118

The special wheeled chassis MAZ-547A was mass-produced from 1970 to 1985. In addition to the "combat" units on the chassis of the MAZ-547 family, a complex of control units and combat duty support vehicles (MOBD) was created, designed to provide control, communications, vital functions and rest for the personnel of the duty forces at the field combat starting positions of strategic PGRK. The first complex where the Chief Designer for the first time provided standard units to ensure the vital functions of personnel was 15P642 "Temp-2S". Subsequently, all these machines and units became part of the developed 15P645 "Pioneer" complex virtually unchanged. Combat support vehicles:
• unit 15T117 – canteen AS-543.1 on a MAZ-543V chassis;
• unit 15T118 – dormitory vehicle AO-543.1 on the MAZ-543V chassis;
• unit 15N1061M - MDES on the MAZ-543A chassis (there were two of them - for the combat zone and for the domestic zone);

• unit 15Y55 – Duty shift vehicle (MDSO) on the MAZ-543V chassis.

The 15T118 unit was first manufactured by the Uritsky plant (trolleybus plant) in Engels, and then at the plant in Shumerlya.

(msk_patriot_missile/pioneer_obsh/dsc_6113.jpg)

(msk_patriot_missile/pioneer_obsh/dsc_6121.jpg)

(msk_patriot_missile/pioneer_obsh/dsc_6123.jpg)

(msk_patriot_missile/pioneer_obsh/dsc_6129.jpg)

Table machine 15T117

The 15T117 unit is designed to ensure the vital functions and rest of personnel, for storing food supplies, preparing food and feeding personnel while on duty in the field. The dining machine is designed to feed 16 people at the same time. When developing a dining car, the galley equipment

(kitchen) was taken almost entirely, without changes, from the Project 205 missile boat. The dining room can be turned into a room for watching television and video programs and listening to radio broadcasts.

(msk_patriot_missile/pioneer_stol/dsc_6708.jpg)

(msk_patriot_missile/pioneer_stol/dsc_6710.jpg)

(msk_patriot_missile/pioneer_stol/dsc_6712.jpg)

(msk_patriot_missile/pioneer_stol/dsc_6714.jpg)

"I would like to remind you that canteen vehicles (117) and dormitory vehicles (118) have been part of the Temp-2S complex in Plesetsk since 1975, 4 units in each of the 7 military units (OIICH). Then the Pioneers , perhaps, they were not on duty. The military testers told a funny episode from their then life on wheels. Mikhail Tikhonovich L. served as captain in their military unit, a large and self-confident man, a good-natured joker, who first saw the internal equipment of the new vehicles (117 and 118). , he expressed doubts about the effectiveness of the fans installed in the rest compartment, saying that they were weak and made of plastic. There were, as always, people ready to play a trick on Mikhail Tikhonovich. This time, Sergei Aleksandrovich S., Major, succeeded and brought M.T. that he dared to

stop the switched-on fan with his nose. And M.T.'s nose was big enough to match him. When Uncle Misha kissed him, not all of the curious people managed to jump away..."
Source: Russian Arms Forum :: 15T117 – canteen machine (MS-543.1) (http://www.russianarms.ru/forum/index.php/topic,3647.25.html)

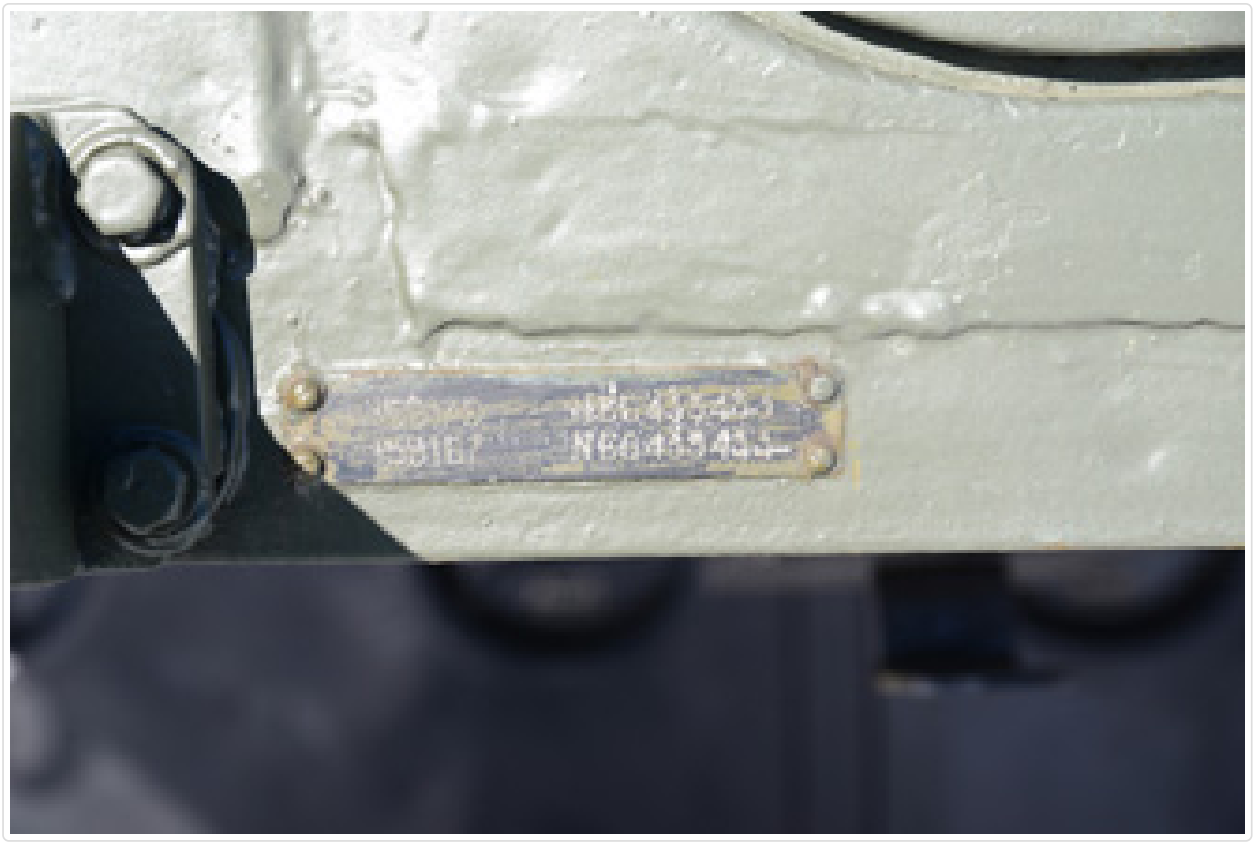
Combat control vehicle 15V167 of the 15P158 Topol missile system

The combat control vehicle (MCV) is designed to organize and carry out combat duty by the command post crew, continuously monitor the parameters of the automatic launcher and missiles, prepare and conduct missile launches. The unit contains combat control equipment, communications equipment (HF, VHF and DV receivers, a service set of communications equipment for controlling a communications vehicle on the move).
Source: ()

(msk_patriot_missile/topol_mbu/dsc_6116.jpg)
Combat control vehicle 15B167

(msk_patriot_missile/topol_mbu/dsc_6120.jpg)
Filter and ventilation device on the front wall of the body

(msk_patriot_missile/topol_mbu/dsc_6122.jpg)
There are 2 entrances in the walls of the body - a double-leaf one at the rear end of the unit and a single-leaf one on the right side of the unit, in the first compartment. The entrance on the starboard side was considered an emergency and was used only when collapsing or deploying the unit.



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MLRS "Smerch" combat vehicle 9A52-2

(msk_patriot_missile/smerch/dsc_6131.jpg)

(msk_patriot_missile/smerch/dsc_6145.jpg)

(msk_patriot_missile/smerch/dsc_6147.jpg)

(msk_patriot_missile/smerch/dsc_6149.jpg)

(msk_patriot_missile/smerch/dsc_6151.jpg)

(msk_patriot_missile/smerch/dsc_6152.jpg)

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(msk_patriot_missile/smerch/dsc_6155.jpg)

The exhibit is located on the territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/smerch/dsc_6156.jpg)

(msk_patriot_missile/smerch/dsc_6159.jpg)

(msk_patriot_missile/smerch/dsc_6363.jpg)

(msk_patriot_missile/smerch/dsc_6366.jpg)

MLRS BM-13N based on ZIS-151

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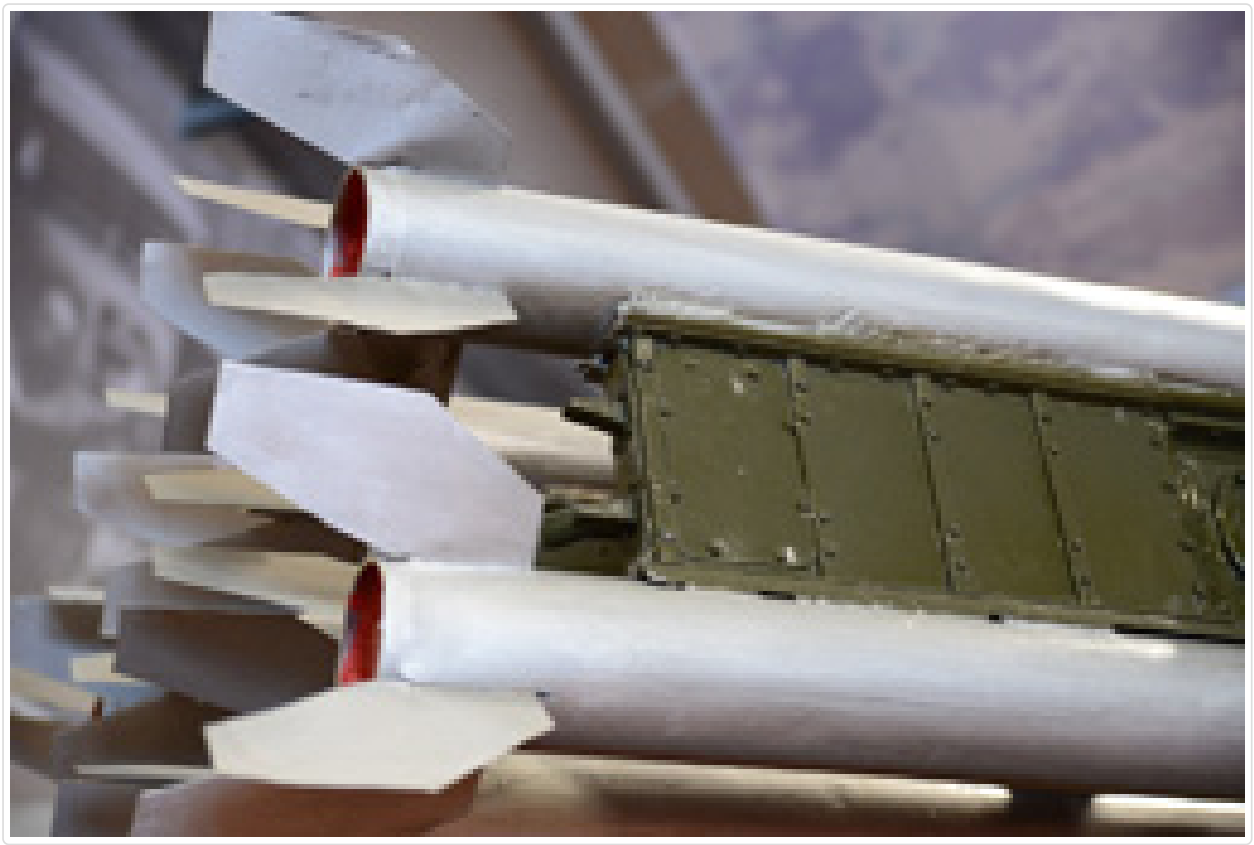
(msk_patriot_missile/bm-13n/dsc_6823.jpg)



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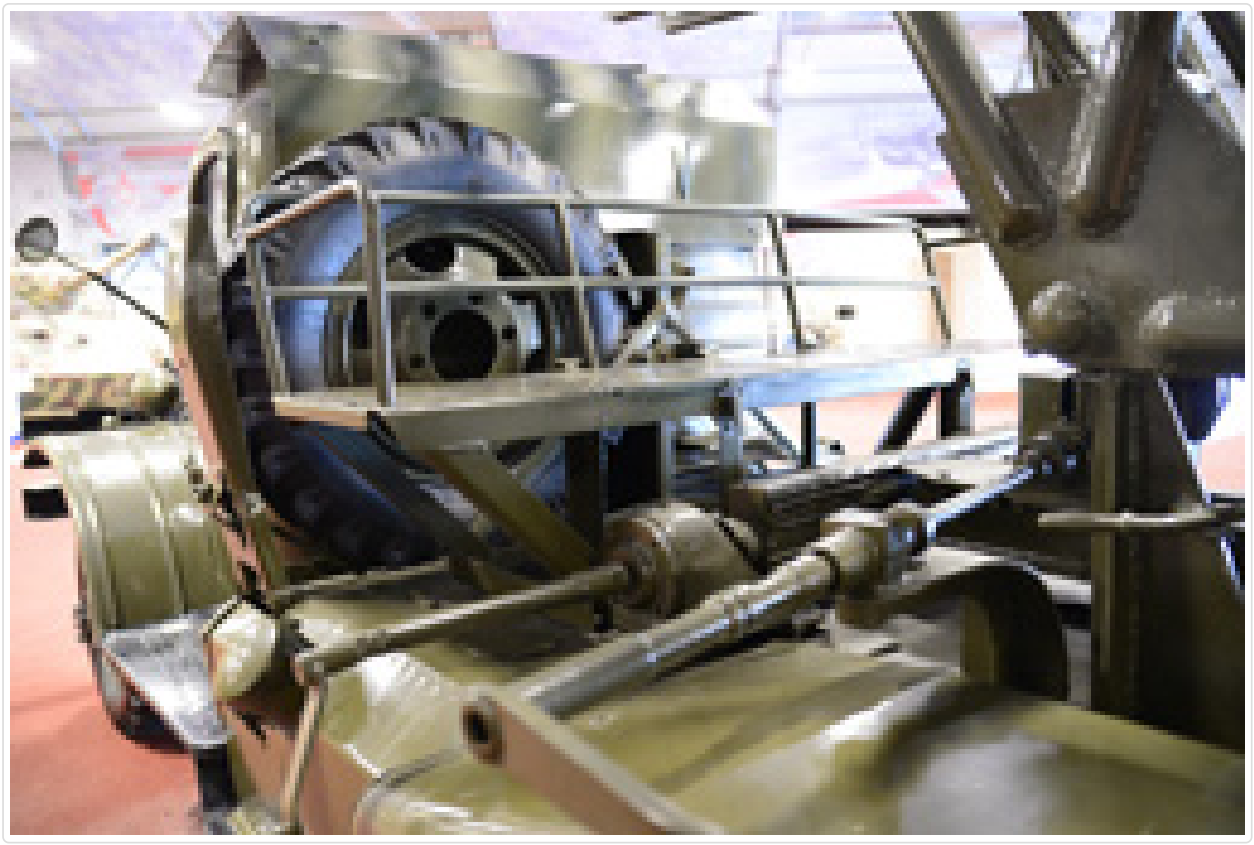

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(msk_patriot_missile/bm-13n/dsc_6832.jpg)

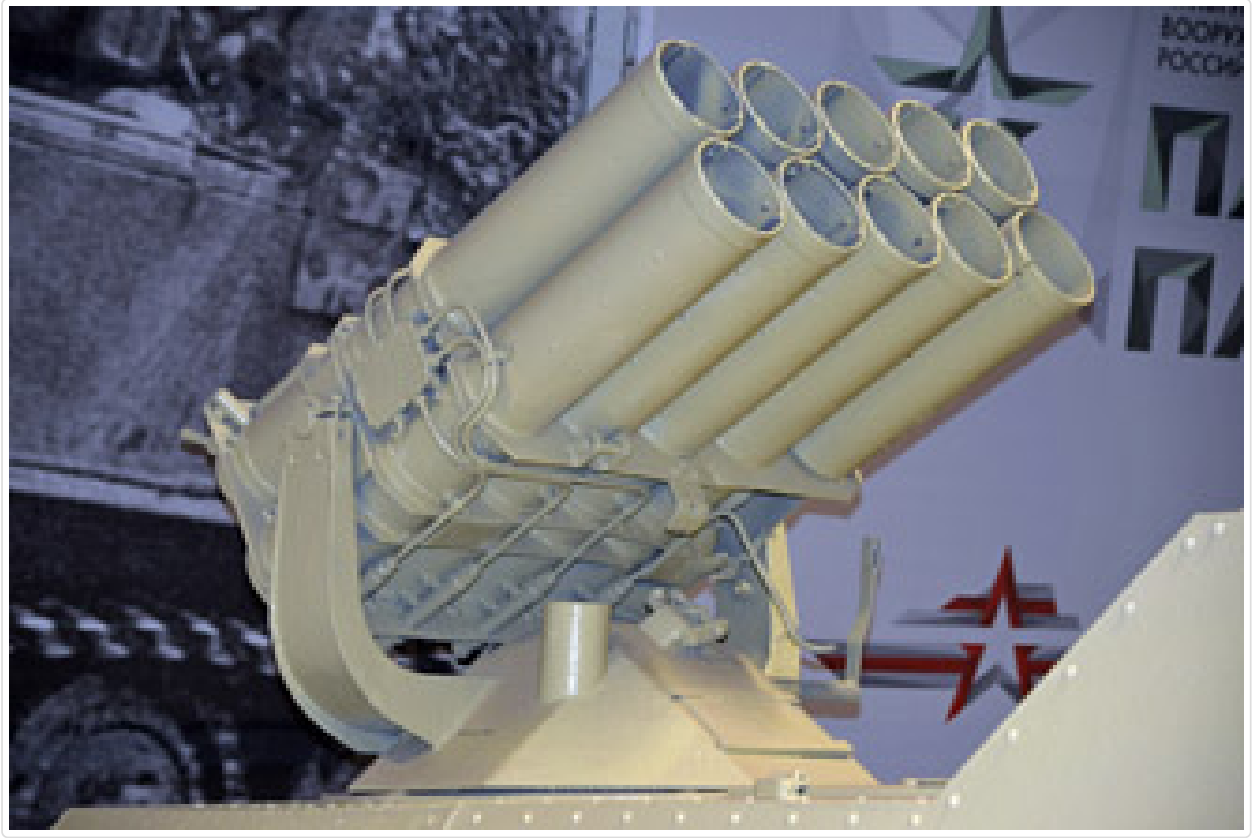
(msk_patriot_missile/bm-13n/dsc_6900.jpg)

See also:
BM-13 rocket artillery combat vehicle. VIMAIViVS, St. Petersburg (spb_art_missile.htm#ancor17)
Rocket artillery combat vehicle BM-13-16 on a ZIS-6 chassis. VIMAIViVS, St. Petersburg (spb_art_interbellum.htm#ancor7)
Multiple launch rocket system BM-13. Museum of Russian Military History in Padikovo (padikovo_sau.htm#ancor1)
MLRS BM-13N on the ZIS-151 in the Central Museum of the Armed Forces, Moscow (army_museum_open_missiles.htm#ancor1)
BM-13N on the basis of the ZIS-151. Military-patriotic park "Patriot" (msk_patriot_missile.htm#ancor17)
BM-13N on the open area of the Central Museum of the Great Patriotic War, Moscow (msk_poklonnaya.htm#ancor12)
BM-13N on the Zis-151 chassis in the Nizhny Novgorod City Museum of Technology and Defense Industry (nn_park_15.htm#ancor1)
MLRS BM-13N on display at the historical and cultural complex "Stalin Line" , Minsk (minsk_stalin_line_arms.htm#ancor7)
BM-13N. Belarusian State Museum of the History of the Great Patriotic War, Minsk (minsk_vov.htm#ancor25)
BM-13N model 1943 in the "Combat Glory of the Urals" museum, Verkhnyaya Pyshma (pysh_missiles.htm#ancor2)
BM-13NM model 1958 in the museum "Combat Glory of the Urals", Verkhnyaya Pyshma (pysh_missiles.htm#ancor3)
BM-13NMM 2B7R model 1966 in the museum "Battle Glory of the Urals", Verkhnyaya Pyshma (pysh_missiles.htm#ancor4)
BM-13N based on ZIS-151 at the district officers' house, Yekaterinburg (ekb_gdo.htm#ancor7)
BM-13NM based on ZIS-151, Military Museum, Belgrade, Serbia (kalemegdan_14.htm#ancor41)
Artillery unit BM-13N in the museum of Fort No. 5 "Friedrich Wilhelm" III", Kaliningrad (fort5.htm#ancor4)
BM-13HMM, museum-panorama "Battle of Stalingrad", Volgograd (volgograd_panorama.htm#ancor1)
BM-13HM mod. 1958 on the ZIL-157 chassis in the Saratov Museum of Military and Labor Glory (saratov_sokol_gora_guns.htm#ancor2)
BM-13NMM (2B7R) combat vehicle of the 1966 model in the Pionersky park, Penza (penza_victory_square.htm#ancor3)

MLRS 15cm Panzerwerfer 42 Auf.Sf (Sd.Kfz.4/1)

(msk_patriot_missile/panzerwerfer/dsc_4149.jpg)

The German self-propelled MLRS was created in 1942 on the basis of the Opel Maultier half-track truck.



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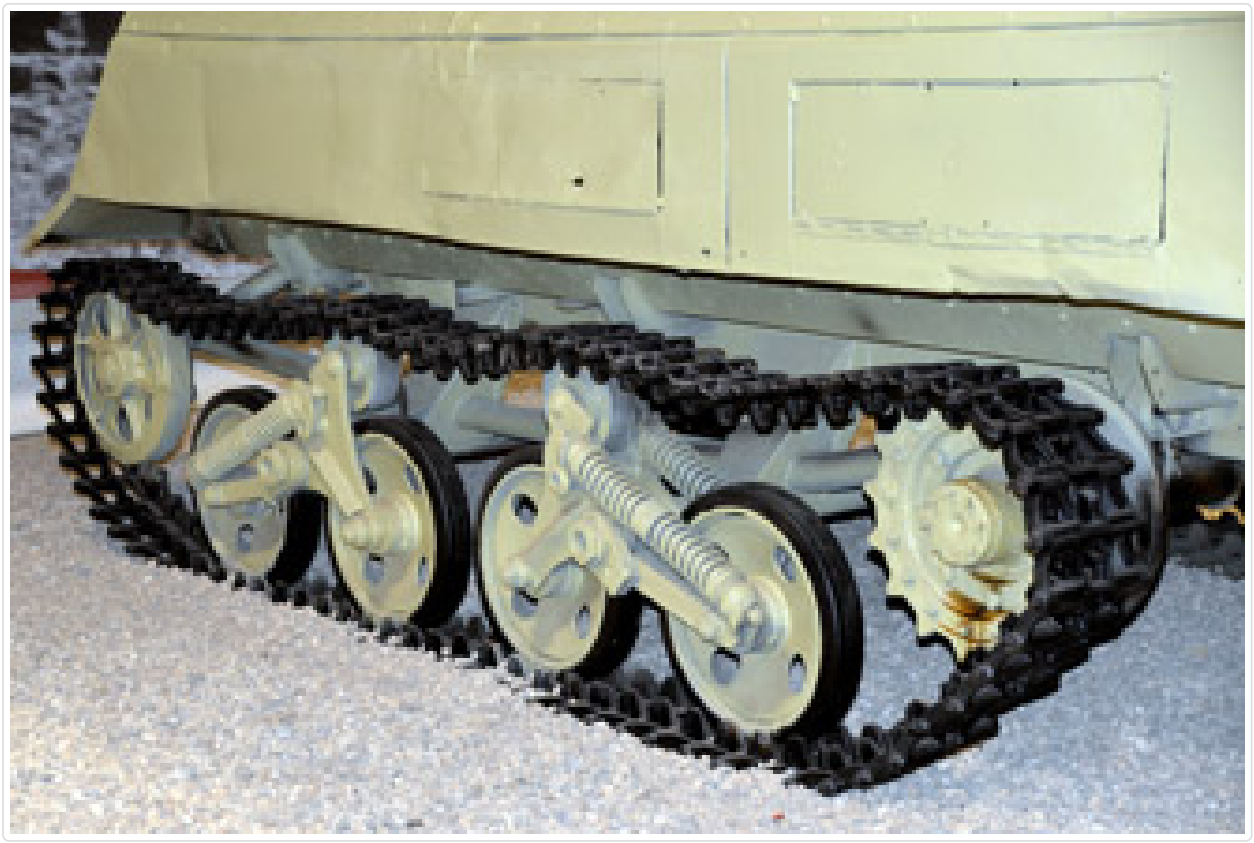


(msk_patriot_missile/panzerwerfer/dsc_4153.jpg)

(msk_patriot_missile/panzerwerfer/dsc_9379.jpg)

(msk_patriot_missile/panzerwerfer/dsc_9380.jpg)

(msk_patriot_missile/panzerwerfer/dsc_9381.jpg)

(msk_patriot_missile/panzerwerfer/dsc_4154.jpg)

Cruise missile 3M-25 "Meteorite" (P-750 "Grom")

(msk_patriot_missile/meteorit/img_5587.jpg)

Copy No. 1. The main exhibition of the Patriot Park

(msk_patriot_missile/meteorit/img_5589.jpg)

(msk_patriot_missile/meteorit/img_5591.jpg)

(msk_patriot_missile/meteorit/img_5593.jpg)

" *This is what Yu. Mozzhorin writes about the flight tests of the medium-range cruise missile "Meteorite" - During the first test, at the moment of separation of the launch boosters, the cruise missile turned over and fell. All data on the aerodynamics of the missile was provided by TsAGI. The cause of the accident was neglect of the influence on the behavior of the rocket of jets of small powder engines, which remove spent accelerators from it. The jets of the engines distorted the nature of the flow around the wings of the rocket, causing a strong moment of its roll.*

Ship tests of the complex were initially supposed to be carried out with one of the Project 675 submarines, but in the future, at the suggestion of LPMB. Rubin, decided to convert for this purpose one of the RPK SN pr.667A, withdrawn from the strategic forces under the SALT-1 treaty, bearing in mind not only the testing on this submarine, but also the subsequent operation of the boat as a combat unit for conversion. allocated the submarine K-420 (production number 432), on which the missile compartments were cut out and destroyed and related repairs were performed. Sevmash enterprise was appointed as the construction plant.

The technical project for the conversion of the nuclear submarine pr. 667A to the Meteorit-M missile system (project 667M) was developed by LPMB "Rubin" in the 1st quarter of 1979. The project provided for the placement of 12 launch containers with 3M-25 missiles, located obliquely on the sides (45 degrees) outside the durable hull - in the double-sided space at an angle of 45°. To do this, it was necessary to form a new middle block of the hull to replace the cut out missile compartments of the base submarine, increase the length of the ship by approximately 20 m and the width to 15 m, which led to a change in the architectural appearance of the submarine after the conversion. The new compartments housed the Klever pre-launch preparation and launch equipment, control equipment for the ship's daily and pre-launch maintenance systems (AU KSPPO) "Korshun-44", KSPPO pneumatic hydraulic systems, as well as living and public accommodations for the crew.

Some rearrangement was also carried out in the central post in connection with the installation of a new control system for the Andromeda missile weapons complex, a new Tobol-AT navigation complex, a Molniya-LM1 radio communications complex and a Rubicon hydroacoustic complex. In order to keep the boat in the starting corridor during salvo firing, a Bor control system was installed. The launch could be carried out from a depth of up to 40 m at a submarine speed of up to 10 knots.

Work on the re-equipment and repair of the submarine was carried out by Sevmash at an exceptionally fast pace. So, on June 18, 1980, the boat was placed in the boathouse, already on October 15, 1982, the fully formed submarine was launched, and from November 1, 1982 to August 4, 1983, it underwent

mooring and factory sea trials. State tests took place from August 16, 1983 to November 1, 1983, but without the missile weapons complex due to its unpreparedness for flight tests on the ship. Based on the results of state tests, a certificate of completion of the conversion of the boat was issued for joint testing of the complex.

Testing of missiles by launches from a ground stand (Kapustin Yar test site) and a floating test stand of the PSK on the Black Sea took place in parallel with the re-equipment of the ship. In total, according to the flight design test program from stands in 1982-1987. More than 30 launches of 3M-25 missiles were carried out. Although flight development tests of the submarine complex began on December 27, 1983 in the Barents Sea, they continued through 1986 inclusive (1 launch in 1984 and 1 launch in 1986).

There were several reasons for such a long development of the complex, but, perhaps, the main one was the large number of fundamentally new technical solutions adopted in the project: "wet" underwater launch of a cruise missile under the launch-acceleration stage, an inertial guidance system with correction based on radar maps of the area, a multifunctional complex protection, etc. All these progressive solutions required careful experimental testing, which led to multiple repeated tests and, accordingly, to numerous postponements of delivery deadlines.

As a result, joint (state) tests of the Meteorit-M complex began only in 1988, first from a ground stand (4 launches), and then from a submarine (3 launches). Unfortunately, the number of successful launches at all stages of testing approximately corresponded to the number of unsuccessful ones, since the complex was still not brought to perfection. This circumstance, as well as the need to build specialized carriers, led to the fact that, by a joint decision of industry and the Navy, work on the Meteorit-M complex was stopped at the end of 1989. Tests on the K-420 were completed on December 15, 1989. In 1990, the equipment of the complex from the submarine was removed and the K-420 in a torpedo version was included in the Northern Fleet in December of the same year. In July 1994, the submarine was removed from the fleet's operational strength, transferred to long-term storage and laid up.

A total of 50 missile launches were carried out from the ground stand, the PSK and the submarine.

Work on the aviation version took quite a long time. In total, out of about 100 flight prototypes of the Meteorite, 70 were used in the flight test. Such a large flight test program made it possible to practically complete the rocket. But in 1992, work on "Meteorite" was stopped. "

Source:SKR "Meteorite" - testpilot.ru (https://testpilot.ru/russia/chelomei/p/750/)

(msk_patriot_missile/meteorit/dsc_8309.jpg)

(msk_patriot_missile/meteorit/dsc_6669.jpg)

(msk_patriot_missile/meteorit/dsc_6670.jpg)

(msk_patriot_missile/meteorit/dsc_6718.jpg)

" *...Unfortunately, the number of successful launches at all stages of testing approximately corresponded to the number of unsuccessful ones, since the complex was still not brought to perfection. The low quality of manufacture of both the rocket itself and its individual units also had an impact. In addition, the cost of re-equipment for the "Meteorit-M" complex, the SSBN of Project 667 turned out to be too high. As a result, by a joint decision of the industry and the Navy, work on the program was stopped at the end of 1989. The ship part of the complex was transferred for safekeeping to the submarine personnel, and the boat itself in 1990. handed over to the fleet in a torpedo version.* "
Source: Evgeny Druzin, "Winged "Meteor" for strategic purposes" (https://vpk.name/news/84673_kryilatyii_meteorit_strategicheskogo_naznacheniya.html) ("Military-Industrial Courier", No. 7 (475) 02/20/2013)

Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6642.jpg)
Instance No. 2. Pavilion of JSC Tactical Missile Weapons Corporation

Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6643.jpg)

Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6650.jpg)

Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6651.jpg)

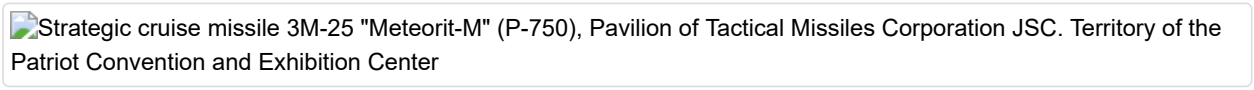
" *Despite the very high level of tactical and technical characteristics for cruise missiles, the Meteorit-M missile weapon complex could not make a significant contribution to the combat capabilities of naval strategic nuclear forces in a retaliatory strike. If the work was successfully completed in 1990 and allocated for the complex "Meteorit-M" 12 Project 667A submarines, the number of deployed cruise missiles would have been 144. During this period, 2804 nuclear warheads were deployed on SLBMs.*

Thus, the number of nuclear warheads deployed on "Meteorit-M" missiles would have been 5%. from the number of SLBM warheads. Due to the relatively short flight range of the Meteorit-M missile submarines, in order to fire at targets in the United States, they would have to break through the anti-submarine defense lines of the SOSUS system. Cruise missiles would have to overcome the powerful air defense system of the North American continent, which is already in service. consisted of multi-channel Patriot air defense systems capable of intercepting high-speed air targets. Unlike cruise missiles, SLBMs could not be intercepted by air defense systems, and missile defense systems were limited by the 1972 ABM Treaty in force at that time.

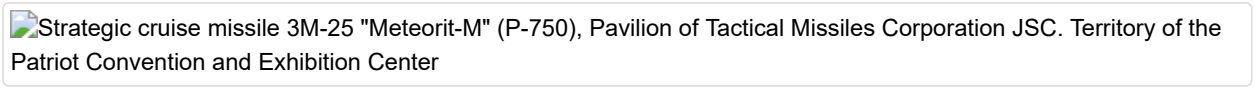
In 1990, the vast majority (93%) of SLBM nuclear warheads were carried on missiles with an intercontinental range. Submarines with such missiles could be used against remote enemy targets without leaving the waters controlled by the USSR Navy near its coast. In this regard, the combat stability of submarines equipped with intercontinental SLBMs was significantly higher than that of missile carriers armed with the Meteorit-M missile launcher. As a result, the contribution of the Meteorit-M complexes to the effectiveness of the retaliatory strike of naval strategic nuclear forces would be less than 1%.

The creation of the Meteorit-A aviation missile system was more justified. The Air Force, unlike the Navy, did not have ballistic missiles in service. "

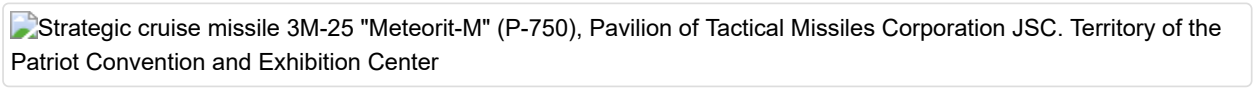
Mikhail Kardashev, "Flight of the man-made "Meteor"" (https://airmuseum.ru/2013/04/polet-rukotvornogo-meteorita/)


Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6653.jpg)


Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6654.jpg)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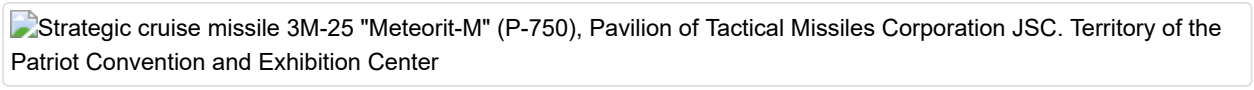
(msk_patriot_missile/meteorit/dsc_6655.jpg)


Strategic cruise missile 3M-25 "Meteorit-M" (P-750), Pavilion of Tactical Missiles Corporation JSC. Territory of the Patriot Convention and Exhibition Center

(msk_patriot_missile/meteorit/dsc_6690.jpg)

See also:

3M25 "Meteorit-M" cruise missile. Vadim Zadorozhny Museum of Technology (msk_zador_guns.htm#ancor29)

Engine RD-0242 of the launch-acceleration stage of the 3M25 "Meteorite" cruise missile. National Museum of Rocket and Space Technology at the FKP "Scientific Research Center RKP" (zagorsk.htm#ancor19)

Cruise missile P-15M with active radar homing head DS-M

(msk_patriot_missile/p15/dsc_4545.jpg)

(msk_patriot_missile/p15/dsc_4560.jpg)

(msk_patriot_missile/p15/dsc_4561.jpg)

(msk_patriot_missile/p15/dsc_4562.jpg)

Launcher SPU-35B of the Redut coastal anti-ship complex

(msk_patriot_missile/redut/dsc_4564.jpg)

(msk_patriot_missile/redut/dsc_4566.jpg)

(msk_patriot_missile/redut/dsc_4567.jpg)

(msk_patriot_missile/redut/dsc_4568.jpg)

(msk_patriot_missile/redut/dsc_8310.jpg)

(msk_patriot_missile/redut/dsc_8355.jpg)

(msk_patriot_missile/redut/dsc_8359.jpg)

(msk_patriot_missile/redut/dsc_8360.jpg)

Launcher 3S51 of the Rubezh anti-ship complex

(msk_patriot_missile/rubej/dsc_8311.jpg)

(msk_patriot_missile/rubej/dsc_8347.jpg)

(msk_patriot_missile/rubej/dsc_8348.jpg)

(msk_patriot_missile/rubej/dsc_8356.jpg)

Launcher 9P129 of the 9K79 Tochka tactical missile system

"The development of the Tochka divisional missile system was started by the Resolution of the Council of Ministers of March 4, 1968. The Tochka complex was intended to destroy ground-based reconnaissance and strike complexes, command posts of various types of troops, aircraft and helicopter stands, and reserve force groups with a missile launcher. , storage of ammunition, fuel and other materiel. The Kolomna Mechanical Engineering Design Bureau was appointed as the lead designer, and

the missile control system was developed at the Central Research Institute of AG. The launcher was designed and mass-produced by the Barricades Production Association. Volgograd. Serial production of the missiles was carried out by the Votkinsk Machine-Building Plant. The chassis for the launcher and transport-loading vehicles were manufactured in Bryansk. The first two launches of Tochka guided missiles were carried out in 1971 during factory flight tests. started in 1973, although the complex was officially put into service in 1976. The Tochka complex had a firing range of 15 to 70 km and an average circular deviation of 250 m.

In April 1971, development of the Tochka-R modification began, with a passive homing system for radio-emitting targets (radars, radio stations, etc.). The guidance system provided a target acquisition range at a distance of at least 15 km. At the same time, the design of the missile, with the exception of the warhead, remained unchanged. It was assumed that the accuracy of Tochka-R's guidance on a continuously operating target did not exceed 45 m, and the affected area was over two hectares. In 1989, the modified 9K79 Tochka-U complex was put into service. Its main difference is its long range and shooting accuracy. "

Source: Russian Arms Forum :: 9K79 "Tochka" - tactical missile system (http://www.russianarms.ru/forum/index.php/topic,1029.0.html)

(msk_patriot_missile/tochka/dsc_6058.jpg)

The launcher is mounted on a three-axle amphibious vehicle chassis BAZ-5921

(msk_patriot_missile/tochka/dsc_6060.jpg)

(msk_patriot_missile/tochka/dsc_6075.jpg)

The main task of the complex: defeat unarmored targets and untrenched l / s over a large area

(msk_patriot_missile/tochka/dsc_6133.jpg)
Launcher 9P129 and container 9YA234 nearby

(msk_patriot_missile/tochka/dsc_6143.jpg)
The front and rear pairs of wheels are steerable, which provides a relatively small turning radius of 7 meters.

(msk_patriot_missile/tochka/dsc_6142.jpg)

(msk_patriot_missile/tochka/dsc_6139.jpg)

(msk_patriot_missile/tochka/dsc_6135.jpg)

(msk_patriot_missile/tochka/dsc_6146.jpg)

Preparation time for launch: from readiness No. 1 - 2 minutes, from march - 16-20 minutes; leaving the firing position – 1.5 min.

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(msk_patriot_missile/tochka/dsc_6361.jpg)

(msk_patriot_missile/tochka/dsc_6362.jpg)

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Hypersonic experimental aircraft based on the X-90 missile

“The most important area of work of the Raduga IKB was the development of hypersonic speeds. The struggle for speed has always been one of the key areas for increasing the efficiency of Raduga aircraft. Model 2 On average, it took 10 years to increase the Mach number by one unit. In the 1960s M = 1.0-1.5 was achieved, in the 70s - 2.5-3, in the 80s - 3-4. Each M unit is a new aerodynamics, consistent with the requirements of the Stealth technology, new structural ones. solutions, calculation methods, new metallurgy, experimental verification of everything...

The Raduga IKB developed several prototypes and projects of hypersonic models for testing hypersonic aircraft engines, two of which (Model 1 and Model 2) were tested in flights, respectively, in 1973 -78 and in 1980-1985. Information about this was provided by the IKB together with TsAGI at the MAKS-97 air show.

Preparation for the production and production of missiles on the B-239 IKB "Raduga" began in 1986 at the Tushinsky Machine-Building Plant. and design prototypes on the B-239 theme, three flight prototypes of the missiles were built."

Source: X-90 GELA | Website of the Russian Internet encyclopedia “Aerospace Testers” (https://testpilot.ru/russia/raduga/gela/)

(msk_patriot_missile/gela/dsc_6681.jpg)

The exhibit is located on the stands of the exhibition pavilion of the Tactical Missile Weapons Corporation (Territory of the Patriot Convention and Exhibition Center)

(msk_patriot_missile/gela/dsc_6682.jpg)

(msk_patriot_missile/gela/dsc_6685.jpg)

(msk_patriot_missile/gela/dsc_6688.jpg)

"On the basis of the X-90 rocket project, in the late 1980s - early 1990s, an experimental hypersonic vehicle - GELA was created and tested. According to unconfirmed data from TV programs, the first flight tests of either a prototype of the X-90 or GELA took place at Engels Air Base in early December 1987. Work on the X-90 project was discontinued in 1992.
In the West, the name AS-19 Koala cruise missile is used (previously the designation AS-X-19 was used for the Meteorite missile launcher), since the system initially had a military purpose. This supersonic cruise missile Kh-90 with a range of 3000 km was created to replace the Kh-55. The missile can carry two warheads with individual guidance, capable of hitting two targets at a distance of 100 km. The

carrier of the Kh-90 could be an extended version of the Tu-160M. the rocket was suspended in 1992." Source: X-90 GELA | Website of the Russian Internet encyclopedia "Aerospace Testers" (https://testpilot.ru/russia/raduga/gela/)

(msk_patriot_missile/gela/dsc_6689.jpg)

(msk_patriot_missile/gela/dsc_6692.jpg)

(msk_patriot_missile/gela/dsc_6693.jpg)

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"For the first time in public, the GELA device was demonstrated in an open parking lot at the pavilion of the Raduga design bureau at the MAKS-1995 air show. The device, about 12 m long, is equipped with a supersonic air-breathing engine using kerosene. It is launched from a Tu-95 carrier aircraft. After After releasing the GELA, the triangular folding wing and vertical tail are opened, the solid propellant engine is started, located in the combustion chamber of the SPVJD and accelerating the vehicle to supersonic speed. Then the sustainer engine is put into operation, providing cruising hypersonic flight at M = 4-5. - the accelerator was developed by TMKB "Soyuz", chief designer - D.D. Gilevich. Bench tests of the

ramjet engine for GELA were successfully completed in October 1988."
Source: X-90 GELA | Website of the Russian Internet encyclopedia "Aerospace Testers" (https://testpilot.ru/russia/raduga/gela/)

Propulsion system of the emergency rescue system of the Soyuz-TMA spacecraft

Exhibition pavilion of Tactical Missiles Corporation JSC.

The system uses a solid propellant propulsion system of the emergency rescue system (DU SAS) 855M and four solid propellant rocket engines of the nose fairing (RDG) 860M, developed by JSC Iskra Iskra. I.I. Kartukov" (part of the Tactical Missile Weapons Corporation), which ensure the removal of the detachable head unit (GB) with astronauts in the event of a launch vehicle accident at the initial stage of launching the spacecraft into orbit.

(msk_patriot_missile/sas/dsc_6678.jpg)

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(msk_patriot_missile/sas/dsc_6680.jpg)

(msk_patriot_missile/sas/dsc_6683.jpg)

(msk_patriot_missile/sas/dsc_6686.jpg)

"The emergency rescue system for the crew of the manned spacecraft Soyuz MS-10 worked automatically after the accident of the Soyuz-FG rocket that occurred on October 11. Viktor Volchkov, deputy chief designer for space technology at the Iskra mechanical engineering design bureau, told reporters on Saturday.

” If an accident occurred at the start, as it happened in 1983, then there is a special team that monitors the operation of the rescue system from Earth and turns it on. And here, when everything happened in flight, the automation worked,” he said.

According to Volchkov, in 1983 the previous version of the rescue system was used, and in 1986 the sixth generation version was developed, which is still in use today.

He explained that The launch of the Soyuz launch vehicle from zero to the moment of insertion into orbit is considered the most important, risky and quite dangerous. “The entire orbit is divided into several sections. The logic of the rescue system is to use different action algorithms in a given situation. At the site, when a normal flight is in progress, the task of rescuing cosmonauts is performed by the propulsion system of the emergency rescue system - product 855M,” said the deputy chief designer.

According to him, this installation is a complex of engines.

“It consists of a central engine, which in turn two-chamber and three-mode. Both the main camera and the small one, or both together, can work. The task of retracting the propulsion system of the emergency rescue system (ESAS) during normal flight is performed by the upper multi-nozzle separation engine. During a normal flight, the SAS remote control is reset at the 114th second,” added Volchkov.

He clarified that the rescue system uses four engines, which are responsible for issuing control torque depending on the wind situation through four stabilization channels. “On the section after the SAS remote control is reset (114th second) and until the head fairing separates, the task of moving the ship with cosmonauts away from the emergency carrier is performed by rocket engines on the 860M head fairing,” explained the deputy chief designer.

Source: Iskra ICB: the emergency rescue system for the Soyuz MS-10 crew worked automatically - Cosmos - TASS (https://tass.ru/kosmos/5671576)

Anti-ship missile "Yakhont" - export version of 3M55 "Onyx" (P-800)

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(msk_patriot_missile/yahont/dsc_6668.jpg)

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(msk_patriot_missile/yahont/dsc_6670.jpg)

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Anti-ship missile 4K34 (P-5)

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(msk_patriot_missile/p5/dsc_6658.jpg)

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Anti-ship missile 3M-80E of the Moskit-E complex (P-270)

"According to the Decree of the Council of Ministers of the USSR (dated January 4, 1981 No. 17-5), the complex was modernized in order to increase the firing range by improving the characteristics of the main engine. 10 test launches of the Moskit-M anti-ship missile system were carried out in the period 1987-1989 from a boat Project 1241.1. A maximum range of 153 km was achieved, and the modified anti-ship missile was designated 3M-80E."
Source: Moskit (SS-N-22, Sunburn, ASM-MSS), anti-ship missile system with 3M-80 cruise missile (https://topwar.ru/927-moskit-ss-n-22-sunburn-asm-mss-protivokorabelnyj-raketnyj-kompleks-s-krylatoj-raketoj-3m-80.html)

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